715.

United States Department of Agriculture,

OFFICE OF EXPERIMENT STATIONS.

A. C. TRUE, Director.

LIST OF PUBLICATIONS OF THE OFFICE OF EXPERIMENT STATIONS ON THE FOOD AND NUTRITION OF MAN.

[Corrected to June 1, 1904.]

FOR GRATUITOUS DISTRIBUTION.

[Requests for these publications should be sent to the Secretary of Agriculture or to a Senator or Representative in Congress.]

FARMERS' BULLETINS.

Farmers' Bulletin No. 34.—Meats: Composition and Cooking. By Chas. D. Woods. Pp. 29, figs. 4, charts 4.

This contains concise explanatory statements regarding the structure, composition, texture, flavor, and digestibility of meats; practical suggestions regarding different methods of cooking meats; and tables showing the composition and fuel value of different kinds and cuts of meats.

Farmers' Bulletin No. 74.—Milk as Food. Pp. 39, charts 2.

Treats of the nutritive value of milk, and contains suggestions as to combinations with other food materials to make well-balanced and economical dietaries.

Farmers' Bulletin No. 85.—Fish as Food. By C. F. Langworthy, Ph. D. Pp. 30.

Shows the food value of fish, the great importance of the fisheries of the United States, and the immense amount of nutritive material taken each year from the salt and fresh waters of this country.

Farmers' Bulletin No. 93.—Sugar as Food. By Mary Hinman Abel. Pp. 27.

The characteristics of cane sugar and other sorts of sugar are discussed, as well as the food value of sugar. The practical use of sugar in the diet of children and adults is spoken of, and general conclusions drawn as to the amount of sugar desirable in the diet and the form in which it may be consumed.

Farmers' Bulletin No. 112.—Bread and the Principles of Bread Making. By Helen W. Atwater. Pp. 39, figs. 3.

The results of a large number of experiments at the different experiment stations and at other American and foreign institutions on different problems connected with bread and bread making are summarized, as well as the information on these topics afforded by standard works. It is not the object of this bulletin to give recipes for making bread, but to explain the reasons for the different steps in bread making in the light of recent investigations.

Farmers' Bulletin No. 121.—Beans, Peas, and Other Legumes as Foods. By Mary Hinman Abel. Pp. 32, figs. 10.

Beans, peas, lentils, and other legumes, used fresh or dried, as articles of diet are described, and their food value as compared with other vegetables and with animal foods is discussed. The principles which govern the cooking of leguminous vegetables are treated, and statistics are given of the use of such foods and their importance in the diet.

Farmers' Bulletin No. 128.—Eggs and Their Uses as Food. By C. F. Langworthy, Ph. D. Pp. 30.

The composition of hen, duck, turkey, goose, and guinea fowl eggs is given, together with that of some egg products and egg substitutes. The bulletin discusses the food value of eggs, their flavor, digestibility, place in the diet, and related topics, as well as the preservation and marketing of eggs.

Farmers' Bulletin No. 142.—Principles of Nutrition and Nutritive Value of Food. By W. O. Atwater, Ph. D. Pp. 48, charts 2.

Definitions are given of the principal terms used in discussions of food and nutrition, and the general laws of the subject are spoken of. Special attention is paid to the composition of food, dietary studies, digestibility, pecuniary economy of foods, and related topics, the text being supplemented by tables and charts. Errors in food economy are pointed out and practical suggestions made.

Farmers' Bulletin No. 182.—Poultry as Food. By Helen W. Atwater Pp. 39.

Data regarding the composition and food value of poultry are summarized and discussed, the topics treated of including among others varieties of poultry, fattening poultry and its effect on food value, dressing and marketing, marks of good poultry, cooking, nutritive value of poultry and its cost, and the place of poultry in the diet.

CIRCULAR.

Circular No. 46.—The Functions and Uses of Food. By C. F. Langworthy, Ph. D. Pp. 10.

This contains definitions of a number of the terms used in discussing food and a statement of some principles of nutrition. The average composition of a number of the more common American foods is quoted, as well as the commonly accepted dietary standards.

SEPARATES.

Some Results of Dietary Studies in the United States. By A. P. Bryant. Pp. 14. Reprinted from Yearbook of Department of Agriculture for 1898.

A popular article describing methods of making dietary studies and discussing the differences in the food habits of people of different occupations and conditions—such as farmers, mechanics, professional men, Mexicans, negroes, and others. Some ways in which the results of dietary studies may be made practically useful are pointed out.

Development of the Nutrition Investigations of the Department of Agriculture. By A. C. True, Ph. D., and R. D. Milner, Ph. B. Pp. 16. Reprinted from Yearbook of Department of Agriculture for 1899.

An historical and statistical account of the nutrition investigations conducted under the auspices of this Department. Many references are also made to American work which antedates these investigations and to later work conducted at American universities and other institutions.

The Value of Potatoes as Food. By C. F. Langworthy, Ph. D. Pp. 16, figs. 3. Reprinted from Yearbook of Department of Agriculture for 1900.

The structure and composition of the potato are spoken of, together with the changes brought about in cooking, the digestibility, place in the diet, and related topics.

Dietaries in Public Institutions. By W. O. Atwater, Ph. D. Pp. 18. Reprinted from Yearbook of Department of Agriculture for 1901.

In addition to a brief review of the history of dietary investigations in public institutions and a discussion of the general principles which underlie such investigations, the article contains an account of dietary studies recently carried on in the New York State hospitals for the insane.

The Cost of Food as Related to Its Nutritive Value. By R. D. Milner, Ph. B. Pp. 19. Reprinted from Yearbook of Department of Agriculture for 1902.

This article is an attempt to illustrate the way in which application can be made of the results of the nutrition investigations to the problem of economy in the diet. What is especially necessary is the consideration of the relation between the cost of food and its value for nourishment. In the purchase of other things, their value for the purpose for which they are intended is taken into account, as well as their cost, and the same principle may well be applied advantageously to the purchase of food. A number of illustrations are given showing how this may be done.

Scope and Results of the Nutrition Investigations of the Office of Experiment Stations. By A. C. True, Ph. D. Pp. 50. Reprinted from Annual Report of the Office of Experiment Stations for 1901.

An historical account of the nutrition investigations carried on in the United States, especially those under the direction of the Office of Experiment Stations. Details of the work carried on by this office and the cooperating experiment stations and other institutions are given, with a list of the publications reporting the results of the investigations.

Dietary Studies of Groups, Especially in Public Institutions. By C. F. Langworthy, Ph. D. Pp. 20. Reprinted from Annual Report of the Office of Experiment Stations for 1902.

One of the most obvious applications of the results of dietary studies is in the feeding of large groups, where the saving of a small sum per person per day is a matter of importance. The results of dietary studies in the Army and Navy and institutions where large groups were fed under uniform conditions have been summarized and discussed. In general, it may be said that such studies have shown that it is often possible to materially improve the diet, and at the same time diminish its cost or furnish a much more palatable diet for the original cost.

Wheat Flour and Bread. By Harry Snyder, Professor of Chemistry, College of Agriculture, University of Minnesota, and Chas. D. Woods, Director Maine Agricultural Experiment Station. Pp. 20. Reprinted from Yearbook of Department of Agriculture for 1903.

The results obtained in the investigations which have been carried on for a number of years on the nutritive value of bread made from different grades of flour are summarized and discussed.

Nutrition Investigations at the Government Hospital for the Insane, Washington, D. C. By W. O. Atwater, Ph. D. Pp. 14. Reprinted from Annual Report of the Office of Experiment Stations for 1903.

The results of dietary studies carried on at the Government Hospital for the Insane are briefly summarized and discussed.

MISCELLANEOUS.

Investigations on the Nutrition of Man in the United States. By C. F. Langworthy, Ph. D., and R. D. Milner, Ph. B. In press.

The origin, development, and extent of the cooperative nutrition investigations carried on under the auspices of the Office of Experiment Stations are spoken of and some of the more important results are summarized and discussed. This account was intended primarily for distribution at the Louisiana Purchase Exposition.

Popular summaries of experiments on food and nutrition carried on at the agricultural experiment stations are published periodically in the series of Farmers' Bulletins entitled "Experiment Station Work." These, like other Farmers' Bulletins, are available for gratuitous distribution.

FOR SALE.

[To secure these publications, address the Superintendent of Documents, Government Printing Office, Washington, D. C., inclosing price given. Remittances must be made by cash or United States postal order. Postage stamps and checks not accepted.]

Bulletin No. 28 (revised).—The Chemical Composition of American Food Materials. By W. O. Atwater, Ph. D., and A. P. Bryant, M. S. Pp. 87, figs. 4. Price 5 cents.

This contains tables showing the maximum, minimum, and average composition and fuel value of a large number of different food materials.

Bulletin No. 29.—Dietary Studies at the University of Tennessee in 1895. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry, University of Tennessee. With comments by W. O. Atwater and Chas. D. Woods. Pp. 45. Price 5 cents.

An account of three dietary studies made with the college club of the University of Tennessee and one dietary study of a mechanic's family in Tennessee, with a discussion of the results.

Bulletin No. 31.—Dietary Studies at the University of Missouri in 1895, and Data Relating to Bread and Meat Consumption in Missouri. By H. B. Gibson, S. Calvert, and D. W. May, University of Missouri. With comments by W. O. Atwater and Chas. D. Woods. Pp. 24. Price 5 cents.

An account of two dietary studies made with the college club of the University of Missouri and compiled information obtained from the students of the University regarding bread and meat consumption at their homes.

Bulletin No. 35.—Food and Nutrition Investigations in New Jersey in 1895 and 1896. By Edward B. Voorhees, A. M., Director New Jersey Agricultural Experiment Stations. Pp. 40. Price 5 cents.

The subjects of these investigations were: (1) The composition and cost of bread in New Jersey; (2) bakery experiments; (3) the composition and cost of milk in cities of New Jersey; and (4) a dietary study. The objects of this work were to secure definite data in regard to the variations in the cost per pound of bread, and positive information concerning the variations that exist in the composition of bread and the relative cost per pound of the nutrients contained in it.

Bulletin No. 38.—Dietary Studies with Reference to the Food of the Negro in Alabama in 1895 and 1896. Conducted with the cooperation of the Tuskegee Normal and Industrial Institute, and the Agricultural and Mechanical College of Alabama. Reported by W. O. Atwater and Chas. D. Woods. Pp. 69, pls. 2. Price 5 cents.

Results of an inquiry into the food of the colored population of the Southern States, especially as regards the kinds, amounts, and composition of the food materials used. It embraces also a consideration of the hygienic and pecuniary economy of their diet, its deficiencies, the ways in which it might be improved, and the steps which should be taken to bring about an improvement.

Bulletin No. 40.—Dietary Studies in New Mexico in 1895. By Arthur Goss, M. S., Professor of Chemistry, New Mexico College of Agriculture and Mechanic Arts. Pp. 23. Price 5 cents.

An account of two dietary studies with Mexican families of limited means and one study of a family in more comfortable circumstances. The composition of a number of foods typical of this region in New Mexico is reported, and the dietary studies are discussed in relation to local conditions and compared with similar studies made elsewhere.

Bulletin No. 43.—Losses in Boiling Vegetables and the Composition and Digestibility of Potatoes and Eggs. By H. Snyder, B. S., Almah J. Frisby, M. D., and A. P. Bryant, M. S. Pp. 31, figs. 7. Price 5 cents.

This bulletin contains three articles: The first, by H. Snyder, is entitled "The Loss of Nutrients in Boiling Potatoes, Carrots, and Cabbages," and reports a number of experiments on the losses which these vegetables undergo when boiled in different ways. The second, entitled "The Digestibility of Potatoes and Eggs," by H. Snyder, reports experiments on the digestibility of boiled eggs in pepsin solution and digestive experiments with a man on a mixed diet of which eggs were the principal constituent. The third article is entitled "The Composition of the Different Parts of the Potato and the Loss of Nutrients During the Process of Boiling," by Almah J. Frisby and A. P. Bryant, and reports the composition of different parts of the potato and experiments on the loss of nutrients when potatoes are boiled in different ways.

Bulletin No. 44.—Report of Preliminary Investigations on the Metabolism of Nitrogen and Carbon in the Human Organism with a Respiration Calorimeter of Special Construction. By W. O. Atwater, Ph. D., C. D. Woods, B. S., and F. G. Benedict, Ph. D. Pp. 64, figs. 4. Price 5 cents.

A detailed description of a respiration calorimeter suitable for experiments with a man is given, and the methods and apparatus employed in the collection and analysis of the liquid, solid, and gaseous excretory products are described. Four experiments are reported in which the subjects remained in the respiration chamber from three to twelve days. The foods and excretory products were analyzed and the balance of income and outgo of nitrogen and carbon determined.

Bulletin No. 45.—A Digest of Metabolism Experiments in which the Balance of Income and Outgo was Determined. By W. O. Atwater, Ph. D., and C. F. Langworthy, Ph. D. Pp. 434. Price 25 cents.

A compilation including 2,300 experiments with man and 1,400 with domestic animals in which the balance of income and outgo of nitrogen, or nitrogen and carbon, with or without oxygen, hydrogen, or mineral matter, was determined. The experiments are classified and arranged, and the tables of results are supplemented by text in which the experiments are described, the objects sought, the experimental methods employed, and the conclusions drawn being noted in more or less detail.

Bulletin No. 52.—Nutrition Investigations in Pittsburg, Pa., 1894–1896. By Isabel Bevier, Professor of Natural Science in the Pennsylvania College for Women, Pittsburg. Pp. 48. Price 5 cents.

The investigations reported in this bulletin are: (1) Six dietary studies—one of a professional man's family and five of families of mechanics and day laborers; (2) the composition and prices of bakers' bread in Pittsburg; and (3) the composition of bread and the changes which the materials undergo in baking.

Bulletin No. 53.—Nutrition Investigations at the University of Tennessee in 1896 and 1897. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry in the University of Tennessee. Pp. 46, figs. 2. Price 5 cents.

The investigations reported in this bulletin are: (1) Studies of the composition of different kinds of meat, including analyses of a side of native Tennessee beef divided into seventeen cuts, according to the usage of the Knoxville market, of a side of native Tennessee mutton divided into six cuts, and of twenty Tennessee chickens, as purchased in the open market; (2) dietary studies including two mechanics' families living in Knoxville, and two college clubs; and (3) twenty-one digestion experiments with healthy men.

Bulletin No. 55.—Dietary Studies in Chicago in 1895 and 1896. Conducted with the cooperation of Jane Addams and Caroline L. Hunt of Hull House. Reported by W. O. Atwater and A. P. Bryant. Pp. 76. Price 5 cents.

In this bulletin fifty dietary studies among children, French Canadians, orthodox Russian Jews, unorthodox Russian Jews, and Bohemians living in the thickly congested district of Chicago are reported, as well as three dietary studies of professional men living in comfortable circumstances. Results are discussed and compared with the results of dietary studies made elsewhere.

Bulletin No. 63.—Description of a New Respiration Calorimeter and Experiments on the Conservation of Energy in the Human Body. By W. O. Atwater, Ph. D., and E. B. Rosa, Ph. D. Pp. 94, pls. 8, figs. 12. Price 10 cents.

The special features of the respiration calorimeter, which have to do with the measurement of the income and outgo of energy, are described. Experiments testing the accuracy of the apparatus are reported in which heat was generated inside the respiration chamber by an electric current or by burning alcohol. Two experiments with a man are also reported.

Bulletin No. 67.—Studies on Bread and Bread Making. By Harry Snyder and L. A. Voorhees. Pp. 51, pls. 2, figs. 3. Price 10 cents.

Two separate papers are included. In the first, Professor Snyder reports the composition of a number of samples of Minnesota bread as compared with its cost; studies of the lots of dry matter, carbon, and nitrogen; the production of soluble carbohydrates and acid; the behavior of wheat proteids; and the changes in the solubility of fat during bread making. Digestion experiments with bread made from patent roller-process flour and bakers' grade flour are also included. Professor Voorhees, in the second paper, reports experiments on the loss of nutrients in bread making, noting especially the changes in the fat, and discusses his investigations in relation to the work of others along similar lines.

Bulletin No. 68.—A Description of Some Chinese Vegetable Food Materials and Their Nutritive and Economic Value. By Walter C. Blasdale, Instructor in Chemistry, University of California. Pp. 48, pls. 8. Price 10 cents.

The composition of a number of vegetable food materials in common use among the Chinese on the Pacific coast of the United States is reported and their food value, etc., discussed. The vegetable products include, among other materials, lotus roots and seeds, taro, lily bulbs and flowers, cassava, lichi nuts, Chinese olives, and water chestnuts.

Bulletin No. 69.—Experiments on the Metabolism of Matter and Energy in the Human Body. By W. O. Atwater, Ph. D., and F. G. Benedict, Ph. D., with the cooperation of A. W. Smith, M. S., and A. P. Bryant, M. S. Pp. 112. Price 10 cents.

A technical bulletin reporting progress in the experiments with the respiration calorimeter. The details of six experiments with healthy men are reported, in which the balance of income and outgo of matter and energy was determined. Check experiments, designed to show the accuracy of the apparatus, are also described in detail.

Bulletin No. 71.—Dietary Studies of Negroes in Eastern Virginia in 1897 and 1898. By H. B. Frissell, D. D., Principal of the Hampton Normal and Agricultural Institute, and Isabel Bevier, Professor of Chemistry at Lake Erie College. Pp. 45, pls. 3. Price 5 cents.

This bulletin describes two separate papers, which together report the details of nineteen dietary studies of negro families in eastern Virginia. Some had been under the influence of Hampton Institute, others had not had such training, while many families had very limited incomes. The results are discussed and compared with those of dietary studies of negroes in Alabama, and with averages of studies of families of different occupations and incomes in other regions.

Bulletin No. 75.—Dietary Studies of University Boat Crews. By W. O. Atwater and A. P. Bryant. Pp. 72. Price 5 cents.

Dietary studies are reported of the Harvard and Yale university and freshman boat crews at their quarters at their respective universities and at Gales Ferry before the annual boat race. A study of the captain of the Harvard freshman crew at Gales Ferry was also made. These investigations were undertaken primarily to secure data regarding the food requirements of men performing severe muscular work. The diet of the boat crews was found to contain more

protein and to furnish more energy than that of students not engaged in such exercise. These and other observed facts are discussed in relation to the results of other dietary studies and the commonly accepted theories of nutrition.

Bulletin No. 84.—Nutrition Investigations at the California Agricultural Experiment Station, 1896–1898. By M. E. Jaffa, M. S., Assistant Professor of Agriculture, University of California. Pp. 39. Price 5 cents.

This bulletin reports four dietary studies of infants, one of the university football team during training, and one of a chemist's family. A digestion experiment with an infant on a milk diet was also made, as well as a metabolism experiment in which the balance of income and outgo of nitrogen was determined. The results are discussed at considerable length.

Bulletin No. 85.—A Report of Investigations on the Digestibility and Nutritive Value of Bread. By Chas. D. Woods, Director, and L. H. Merrill, Chemist, Maine Agricultural Experiment Station. Pp. 51. Price 5 cents.

This technical bulletin is a progress report giving the results of experiments with men on the digestibility of bread of various kinds when eaten alone and when forming part of a simple mixed diet. Artificial digestion experiments with the same sorts of bread were also made, and the metabolic nitrogen in the feces and methods of estimating it were studied. In the experiments with men the balance of income and outgo of nitrogen was determined. A test of skim milk versus water for use in mixing dough showed the value of the former as the resulting bread was richer in protein than that mixed with water. The loss of nutrients which is observed in bread making was also studied.

Bulletin No. 89.—Experiments on the Effect of Muscular Work Upon the Digestibility of Food and the Metabolism of Nitrogen. Conducted at the University of Tennessee, 1897–1899. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry at the University of Tennessee. Pp. 77. Price 5 cents.

Sixteen experiments are reported in which the effect of muscular work upon the digestibility of food and upon the metabolism of nitrogen was studied. The subjects were young men in good health and performed muscular work under different dietary conditions.

Bulletin No. 91.—Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896–1900. By H. S. Grindley and J. L. Sammis, E. F. Ladd, and Isabel Bevier and Elizabeth C. Sprague. Pp. 42. Price 5 cents.

This bulletin reports dietary studies. The two at the University of Illinois were made with the family of an instructor and a club of workingmen; the study at the North Dakota Agricultural College, with a club of woman students; and that at Lake Erie College also with a club of women, including students and instructors. The investigations are discussed and compared with similar work carried on elsewhere in the United States.

Bulletin No. 98.—The Effect of Severe and Prolonged Muscular Work on Food Consumption, Digestion, and Metabolism. By. W. O. Atwater, Ph. D., and H. C. Sherman, Ph. D., and the Mechanical Work and Efficiency of Bicyclers, by R. C. Carpenter, M. S. Pp. 67, figs. 3. Price 5 cents.

A six-day bicycle race at Madison Square Garden, New York City, afforded the authors an opportunity to study the effect of very severe and prolonged muscular work upon the consumption and digestibility of food and the metabolism of nitrogen. The results are compared with those obtained under other conditions of muscular work. In the chapter devoted to a consideration of the mechanical work and efficiency of bicyclers, the amount of work actually performed is discussed, as well as the efficiency of man considered as a machine, and related topics.

Bulletin No. 101.—Studies on Bread and Bread Making at the University of Minnesota in 1899 and 1900. By Harry Snyder, B. S., Professor of Chemistry, College of Agriculture, University of Minnesota, and Chemist of the Agricultural Experiment Station. Pp. 65, pls. 3, fig. 1. Price 5 cents.

Continuing earlier work, digestion experiments were made with bread from whole-wheat flour, graham flour, and standard patent flour, the flours all being ground from the same lot of hard Scotch Fife spring wheat. The standard patent flour, as shown by analysis, contained somewhat less total protein than the flours of lower grade, but was more thoroughly digested. Artificial digestion experiments with bread of different kinds were made as well as experiments in bread making and studies of the effect on digestibility of consuming different amounts of oatmeal and of bread, and the effect on digestibility of increasing the proportion of starch in bread.

Bulletin No. 102.—Experiments on Losses in Cooking Meat, 1898–1900. By H. S. Grindley, D. Sc., Professor of Chemistry, College of Agriculture, University of Illinois, with the cooperation of H. McCormack, M. S., and H. C. Porter, M. S. Pp. 74. Price 5 cents.

Twenty-nine experiments on the losses of material when meat is fried, stewed, and boiled, are reported. The experimental methods followed are described and the results are briefly discussed. The present bulletin is a progress report.

Bulletin No. 107.—Nutrition Investigations Among Fruitarians and Chinese at the California Agricultural Experiment Station, 1899–1901. By M. E. Jaffa, M. S., Assistant Professor of Agriculture, University of California. Pp. 43. Price 5 cents.

This bulletin includes six dietary studies, a digestion experiment, and a study of the metabolism of nitrogen made with persons living practically on a diet of fruit and nuts; also three dietary studies with Chinese engaged in light muscular work, moderate muscular work, and severe labor. The diet of the fruitarians furnished less nutrients and energy than the average diet of persons of similar age and occupation consuming ordinary foods. Instances are, however, on record in which persons consuming a mixed diet have lived on as small amounts. The diet of the Chinese corresponded quite closely as regards nutrients and energy to that of Americans engaged in similar work. Studies like those here reported are useful in determining dietary standards and in similar ways. The results obtained are discussed in relation to the general laws of nutrition.

Bulletin No. 109.—Experiments on the Metabolism of Matter and Energy in the Human Body, 1898–1900. By W. O. Atwater, Ph. D., and F. G. Benedict, Ph. D., with the cooperation of A. P. Bryant, M. S., A. W. Smith, M. S., and J. F. Snell, Ph. D. Pp. 147. Price 10 cents.

Continuing earlier work with the respiration calorimeter, details are reported of thirteen metabolism experiments, in which the balance of income and outgo of matter and energy was determined. Improvements in the apparatus and methods of experimenting are also reported, as well as the results of experiments designed to test the accuracy of the respiration calorimeter. The bulletin concludes with a chapter summarizing the results which have been obtained in experiments like those reported. These conclusions have to do with such questions as the total carbon dioxid and water excreted per day, the amount excreted at night as compared with those excreted during the day, and similar topics. In many cases new values are given for physiological constants.

Bulletin No. 116.—Dietary Studies in New York City in 1896 and 1897. By W. O. Atwater, Ph. D., and A. P. Bryant, M. S. Pp. 83. Price 5 cents.

Thirty-six dietary studies are reported of families, in many cases with limited incomes, living in the thickly-congested districts of New York City. The

results are discussed in relation to dietary standards and the data obtained in similar studies of families living under different circumstances as regards income and occupation.

Bulletin No. 117.—Experiments on the Effect of Muscular Work Upon the Digestibility of Food and the Metabolism of Nitrogen. Conducted at the University of Tennessee, 1899–1900. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry, University of Tennessee. Pp. 43. Price 5 cents.

The results of nine experiments are reported, in which the effects of muscular work upon the digestibility of food and the metabolism of nitrogen were studied, the subjects of the experiments being healthy young men performing muscular work under different dietary conditions. The bulletin also gives the results of tests of the possibility of determining the composition of any given diet by means of composite samples.

Bulletin No. 121.—Experiments on the Metabolism of Nitrogen, Sulphur and Phosphorus in the Human Organism. By H. C. Sherman, Ph. D., Instructor in Analytical Chemistry, Columbia University. Conducted in cooperation with Columbia University. Pp. 47, figs. 3. Price 5 cents.

In ten digestion experiments on a diet of bread and milk, the metabolism of nitrogen, phosphorus, and sulphur was studied with special reference to the cleavage in the body of the nutrients supplying these elements, and the effect of loss of sleep on their excretion. Apparently the digestibility of the food was not influenced by loss of sleep nor by the continuance of the diet for twelve or eighteen days. Marked loss of sleep for three successive nights resulted in a small increase in the amount of nitrogen, sulphur, and phosphorus excreted. The increase of sulphur was proportioned to that of nitrogen and the increase of phosphorus was very slightly larger, the relative difference being no greater than might be attributed to the usual daily variations.

Bulletin No. 126.—Studies on the Digestibility and Nutritive Value of Bread at the University of Minnesota in 1900–1902. By Harry Snyder, B. S., Professor of Chemistry, College of Agriculture, University of Minnesota, and Chemist, Agricultural Experiment Station. Pp. 52, pls. 3. Price 5 cents.

This bulletin reports the results of nine experiments with bread made from different grades of flour ground from hard spring wheat and fifteen experiments with bread made from different grades of flour ground from soft winter wheat. In connection with the digestion experiments the income and outgo of nitrogen was also studied. The results of these investigations are in accord with those obtained in former studies, and indicate that the fine patent flours from both hard and soft wheat are more digestible than corresponding coarse flours, though they contain somewhat less protein and mineral matter pound for pound. The investigations also show that all flours are quite thoroughly digested, and furnish experimental proof of the generally recognized fact that wheat flours of all grades are among the most important articles of diet.

Bulletin No. 129.—Dietary Studies in Boston and Springfield, Mass., Philadelphia, Pa., and Chicago, Ill. By Lydia Southard, Ellen H. Richards, Susannah Usher, Bertha M. Terrill, and Amelia Shapleigh, edited by R. D. Milner. Pp. 103. Price 10 cents.

Five dietary studies at the Boston School of Housekeeping, one at the Bible Normal College, then located at Springfield, now at Hartford, Conn., and twenty-seven studies of poor families in Philadelphia and thirty-three in Chicago are reported. The studies at the School of Housekeeping and at the Bible Normal College are of especial interest, since in the majority of cases the food was planned beforehand, the diet being of a definite cost and so arranged that the nutrients supplied should conform to the commonly accepted dietary standards. These studies show one of the ways in which the results of dietary studies may be practically applied. The results of the studies in Philadelphia and Chicago are of interest for purposes of comparison and in the general discussion of dietary standards.

Bulletin No. 132.—Further Investigations among Fruitarians at the California Agricultural Experiment Station. By M. E. Jaffa, M. S., Assistant Professor of Agriculture, University of California. Pp. 81. Price 5 cents.

The special object of these investigations, as of those reported in an earlier bulletin, was to study the value of fruits and nuts when these articles constituted an integral part of the body. Nine dietary studies and thirty-one digestion experiments were carried out. In the majority of the dietary studies and in all of the digestion experiments fruits and nuts constituted all, or almost all, of the daily foods. As shown by their composition and digestibility, both fruits and nuts can be favorably compared with other and more common foods. At ordinary prices fruits are not expensive as sources of carbohydrates, and nuts are reasonable as sources of protein and fat. The result of the investigations as a whole emphasized the fact that both fruits and nuts should be considered as true foods rather than as food accessories.

Bulletin No. 136.—Experiments on the Metabolism of Matter and Energy in the Human Body, 1900–1902. By W. O. Atwater, Ph. D., and F. G. Benedict, Ph. D., with the cooperation of A. P. Bryant, M. S., R. D. Milner, Ph. B., and Paul Murrill, Ph. D. Pp. 357. Price 20 cents.

The results obtained in 21 experiments on the metabolism of matter and energy in the human body are reported. The experiments were made with the Atwater-Rosa respiration calorimeter, and the report includes a description of the apparatus and of the important modifications and improvements in it and in the analytical methods which have been devised. The present investigations, like those previously reported, yield valuable data regarding the conservation and transformation of matter and energy in the body, the demands of the body for nutriment, the effect of muscular work upon such demand, and the actual nutritive values of different food materials and their constituents, and have for their ultimate object the study of the fundamental laws of nutrition. The results obtained agree very closely with the theoretical values, and warrant the conclusion that the respiration calorimeter is an apparatus of precision. The bulletin also includes a summary of the work carried on to date with the respiration calorimeter, making in all 55 experiments, covering 150 days, with subjects in the respiration chamber.

Bulletin No. 141.—Experiments on Losses in Cooking Meat, 1900–1903. By H. S. Grindley, D. Sc., Associate Professor of Chemistry, College of Science, University of Illinois, and Timothy Mojonnier, M. S. Pp. 95. Price 5 cents.

In continuation of work reported in an earlier bulletin 87 experiments on the cooking of meat were carried on with a view to securing accurate data regarding the changes which take place in cooking by the ordinary household methods, and the effects of cooking upon nutritive value. In general, it may be said that the chief loss in weight when meat is boiled, sautéed, or panbroiled, consists of water removed by the heat of cooking. When meat is roasted the chief losses are water and fat. When meats are boiled, the fatter kinds and cuts, other things being equal, lose less water, nitrogenous, and mineral matter, but more fat than the leaner kinds and cuts. When boiled, sautéed, panbroiled, or roasted the losses increase directly with the time and temperature of cooking.

Bulletin No. 143.—Studies of the Digestibility and Nutritive Value of Bread at the Maine Agricultural Experiment Station, 1899–1903. By C. D. Woods, Director, and L. H. Merrill, Chemist, Maine Agricultural Experiment Station. Pp. 77. Price 5 cents.

The results of 32 experiments with men on the digestibility of bread made from different grades of flour are reported, as well as the data obtained from 30 artificial digestion experiments with similar kinds of bread, the object of the investigations as a whole being to secure information regarding the comparative nutritive value of different grades of flour. In connection with the digestion experiments the balance of income and outgo of nitrogen was determined. The results obtained are in harmony with those obtained in earlier investigations and

show that the breads made from all the common grades of flour are quite thoroughly digested, and, considering both composition and digestibility, differ little in nutritive value. They also emphasize the fact that breads of all sorts are among the most useful and economical articles of diet.

Special studies were also made of methods of estimating the metabolic products in feces and the value of different methods of identifying and separating feces in digestion experiments.

The current literature which relates to food and nutrition is abstracted monthly in the Experiment Station Record. Price 10 cents per number or $1 per year, payable in advance.

PUBLICATIONS NO LONGER AVAILABLE.

[These publications can not be supplied by the Department of Agriculture or the Superintendent of Documents.]

Circular No. 43.—Foods—Nutrients—Food Economy. Pp. 6, diags. 2. Replaced by Circular No. 46.

Farmers' Bulletin No. 23.—Foods: Nutritive Value and Cost. By W. O. Atwater, Ph. D. Pp. 32, diags. 2. Replaced by Farmers' Bulletin No. 142.

Bulletin No. 21.—Methods and Results of Investigations on the Chemistry and Economy of Food. By W. O. Atwater, Ph. D. Pp. 222, charts 3, figs. 15.

This bulletin discusses food and its uses, the composition of food materials, the digestibility of food, preparation and cooking, uses of food in the body, metabolism of energy, pecuniary economy of food, dietaries and dietary standards, and errors in food economy.

Bulletin No. 32.—Dietary Studies at Purdue University, Lafayette, Ind., in 1895. By Winthrop E. Stone, Ph. D., Professor of Chemistry, Purdue University. With comments by W. O. Atwater and Chas. D. Woods. Pp. 28.

An account of dietary studies in the families of a teacher and a tinner in Indiana, with a discussion of the results.

Bulletin No. 37.—Dietary Studies at the Maine State College in 1895. By Whitman H. Jordan, M. S., Director Maine Agricultural Experiment Station. Pp. 57.

This investigation may be termed a feeding experiment with man, as in it an attempt was made to control the sources of protein, which were furnished in cheap and in expensive forms. The influence of an abundance of milk in a dietary was also studied, and the results obtained were compared with those of a dietary study made under normal conditions. The investigation included five dietary studies at the college commons.

Bulletin No. 46.—Dietary Studies in New York City in 1895 and 1896. By W. O. Atwater, Ph. D., and Chas. D. Woods, B. S. Pp. 117.

An account of twenty-one dietary studies of families living in the congested portions of New York City, a family at a mission, and a day nursery at a mission. From the results obtained some deductions are drawn concerning improvements in the living of such families.

Bulletin No. 54.—Nutrition Investigations in New Mexico in 1897. By Arthur Goss, M. S., Professor of Chemistry, New Mexico College of Agriculture and Mechanic Arts. Pp. 20, pl. 1, fig. 1.

This bulletin includes an analytical study of a side of New Mexico range beef which was regarded as typical. The results are compared with studies of beef raised in other regions. A dietary study of a poor Mexican family is also reported.

Bulletin No. 56.—History and Present Status of Instruction in Cooking in the Public Schools of New York City. Reported by Mrs. Louise E. Hogan, with an introduction by A. C. True, Ph. D. Pp. 70, pls. 12.

This bulletin includes an account of the introduction, growth, and present status of teaching cooking in the public schools of New York City. Sample lessons are quoted which show the course followed and exercises, both compositions and drawings prepared by pupils, are also given.

Bulletin No. 66.—The Physiological Effect of Creatin and Creatinin and Their Value as Nutrients. By J. W. Mallet, M. D., LL. D., Professor of Chemistry in the University of Virginia. Pp. 24.

A number of experiments are reported. It was found that creatin and creatinin, which make up the greater part of the nitrogenous material of most meat extracts, do not serve as nutrients in the body. The creatinin is excreted unchanged, while creatin is changed wholly or very largely into creatinin.

Food and Diet. By W. O. Atwater, Ph. D. Pp. 44. Reprinted from Yearbook of Department of Agriculture for 1894.

The demands of the body for nutriment, the relative value of different foods for supplying it, and the food requirements of different individuals are discussed as well as some of the common errors in food economy, methods of avoiding waste, and related topics.

Food and Diet. By W. O. Atwater, Ph. D. (Charts I–IV, size 26 by 40 inches.)

Chart I.—Nutrients of Food and Their Uses in the Body. This shows in tabular form the composition of food materials as purchased, with examples of the different nutrients and functions of each. A definition of food is also given.

Chart II.—Composition of Food Materials. This shows by means of colored lines the composition and fuel value of a number of common food materials, both animal and vegetable.

Chart III.—Pecuniary Economy of Food. This gives the amount of a number of food materials which may be purchased for 10 cents, and shows by means of colored lines the composition and fuel value of each.

Chart IV.—Dietaries and Dietary Standards. This shows by means of colored lines the nutrients and fuel value of the dietaries consumed by the people of various conditions in the United States and other countries. The dietary standards for a man at little work, at moderate work, and at severe work are also given.

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